Introduction to AI
Exercises at week 10

part a

Ex. 1 Consider the following knowledge base $KB = \{\neg p \to q, q \to p, p \to r \wedge s\}$. Decide if the formula $p \wedge r \wedge s$ follows from KB. Try using each of the following methods: truth tables, Modus Ponens only, resolution.

Ex. 2 Come up with a propositional logic formula which uses only implication and negation, and which can not be represented as a Horn clause.

Ex. 3 (7.11 and 7.18 a from the handbook) Any propositional logic sentence is logically equivalent to the assertion that:

- each possible world in which it would be false is not the case;

- some possible world in which it would be true is in fact the case.

From those prove that any sentence can be written in CNF and in DNF.

Ex. 4 Construct an algorithm that converts any sentence in propositional logic into DNF.

Ex. 5 There are three suspects for murder: Jørgen, Thomas, and Nina. Jørgen, says 'I didn't do it. The victim was old acquaintance of Thomas'. But Nina hated him.' Thomas states 'I didn't do it. I didn't know the guy. Besides I was out of town all the week.' Nina says 'I didn't do it. I saw both Jørgen and Thomas downtown with the victim that day; one of them must have done it.' Assume that the two innocent people are telling the truth, but that the guilty might not be. Write out the facts as sentences in Propositional Logic, and use propositional resolution to solve the crime.

Ex. 6 (7.19 from the book) Convert the following set of sentences to clausal form.

- $A \leftrightarrow (C \vee E)$

- $E \to D$

- $B \wedge F \to \neg C$

- $E \to C$

- $C \to F$

- $C \to B$

Give a trace of the execution of DPLL on the conjunction of these clauses.